

ABSTRACT OF THE DISCLOSURE.

Combination of nanolithography and wet chemical etching including the fabrication of nanoarrays of sub-50 nm gold dots and line structures with deliberately designed approximately 12-100 nm gaps. These structures were made by initially using direct write nanolithography to pattern the etch resist, 16-mercaptohexadecanoic acid (MHA), on Au/Ti/SiO_x/Si substrates and then wet chemical etching to remove the exposed gold. These are the smallest Au structures prepared by a wet chemical etching strategy. Also, Dip-Pen Nanolithography (DPN) has been used to generate resist layers on Au, Ag, and Pd that when combined with wet chemical etching can lead to nanostructures with deliberately designed shapes and sizes. Monolayers of mercaptohexadecanoic acid (MHA) or octadecanethiol (ODT), patterned by DPN, were explored as etch resists. They work comparably well on Au and Ag, but ODT is the superior material for Pd. MHA seems to attract the FeCl₃ etchant and results in nonuniform etching of the underlying Pd substrate. Dots, lines, triangles and circles, ranging in size from sub-100 to several hundred nm have been fabricated on these substrates. These results show how one can use DPN as an alternative to more complex and costly procedures like electron beam lithography to generate nanostructures from inorganic materials.